Ecological Site Description—Rangeland

Shale (Sh), 11–14" MAP

MLRA: 58AC – Sedimentary Plains, Central
R058AC052MT

1. Physiographic features: This ecological site occurs on hills, plains, and terraces in shale uplands. Outcroppings of shale often occur. This is a very barren and extremely low-producing ecological site.

Landform: hills, sedimentary plains, terraces
Elevation (feet): 2250 - 4500
Slope (percent): 0–45, but are mainly less than 8
Depth to Water Table (inches): greater than 60
Flooding: none
Ponding: none
Runoff Class: high to very high
Aspect: all, not significant

2. Soils: The soils associated with this ecological site are developed in consolidated (acidic and non-acidic) shales. Shale fragments often occur near the surface. These soils are mainly less than 20 inches deep, and typically have a water holding capacity of less than 2 inches. Colors are often dark due to the parent material (lithochromic) and not organic matter. Textures tend to be clayey.

Salinity/Electrical Conductivity (mmhos/cm): slightly to moderately saline (4–16)
Sodium Absorption Ratio (SAR): 5–13
Reaction (pH) (1:1 water): extremely acid to slightly acid (3.5–6.5)

3. Associated sites: Shallow Clay and Coarse Clay.

4. Similar sites: Coarse Clay, Dense Clay, Saline Upland, and Claypan.

The Coarse Clay differs mainly by having a more diverse community of plants that are typically on a Sandy site.
The Dense Clay site has moderately deep to deep nongranular heavy clays that are overlain by thin ineffectual layers.
The Saline Upland site is dominated by salt tolerant plants.
The Claypan site is moderately deep to very deep soils that have a hard claypan layer at about 2–8 inches from the surface. These sites are all more productive and have a more diverse plant community.

5. Major Plant Community Types: The physical aspect of this site is that of a mixed grassland/shrubland that is typically dominated by medium to short grasses and sedges with a scattered amount of shrubs. Approximately 40–60% of the annual production is from grasses and sedges, 1–5% from forbs, and 20–35% is from shrubs and half-shrubs. Canopy cover of shrubs is 10–15%. The following are descriptions of several plant communities that may occupy this site:

Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs: This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. This plant community contains a low diversity of medium cool season grasses (**bluebunch wheatgrass, thickspike wheatgrass, Montana wheatgrass, and Sandberg bluegrass**). A few forbs occur in small percentages. Shrubs that can occur on this site include **Nuttall's saltbush, winterfat, greasewood, and shadscale**. This site does not allow for very high production.

This plant community is well adapted to the Northern Great Plains climatic conditions. The diversity in plant species and presence of tall, deep-rooted perennial grasses allows for drought tolerance. Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable moisture conditions. Abundant plant litter is available for soil building and moisture retention. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This plant community provides for soil stability and a functioning hydrologic cycle.

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Plant Community 2: Medium and Short Grasses and Shrubs/Subshrubs: Slight degradation in the historic climax plant community, including a beginning response to non-prescribed grazing, will tend to change the HCPC to a community represented by an increase in grasses such as **Sandberg bluegrass, plains reedgrass, and inland saltgrass**. Grasses such as **bluebunch wheatgrass, alkali sacaton and thickspike wheatgrass** may still be present, sometimes in relatively large amounts. The desirable shrubs/subshrubs such as Nuttall's saltbush and winterfat will be present, along with increasing amounts of other shrub species.

Grass biomass production and litter become reduced on Community 2 as the taller grasses become less prevalent, increasing evaporation and reducing moisture retention. Additional open space in the community can result in undesirable invader species. These plant communities provide for moderate soil stability.

Plant Community 3: Shrubs, Short Grasses, Half-shrub, Cactus: With continued heavy disturbance, the site will become dominated by species such as longleaf sagebrush, slenderbush eriogonum, and Sandberg bluegrass. There may still be remnant amounts of some of the mid-seral species such as thickspike and Montana wheatgrass. Taller grasses (bluebunch wheatgrass, alkali sacaton) may still be present, but in much smaller amounts and often under shrubs or mixed in with cactus. Nuttall's saltbush will often still be present. The amount of bare ground between plants also tends to increase.

Plant Communities 3 is much less productive than Plant Communities 1 or 2, and has lost many of the attributes of a healthy rangeland. The loss of deep perennial root systems reduces total available moisture for plant growth. Reduction of plant litter will result in higher surface soil temperatures and increased evaporation losses. Annual species are often aggressive and competitive with seedlings of perennial plants. This community can respond positively to improved grazing management but it will take additional inputs to move it towards a community similar in production and composition to that of Plant Community 1 or 2. The landscape features often associated with this ecological site as well as the droughty nature of the soils severely limits the use of most common structural improvement practices.

5a. Cover and structure (Historic Climax Plant Community)

COVER TYPE	BASAL COVER (%)	CANOPY COVER (%)	AVERAGE HEIGHT (inches)
Cryptogams	0-T	0–T	0.25
Grasses/ sedges	3-7	30–50	24
Forbs	1–2	1–5	18
Shrubs	T–1	5–10	24
Trees	T–1	0-10	30 – 40 feet
Litter	15–25		
Coarse fragments	0–5		
Bare ground	60–80		

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5b. Major Plant Species Composition - Historical Climax Plant Community

Common Name	Plant Symbol	Plant Group	Percent Comp.	Group Max. %	Mean Annual Precipitation (inches)			
					11 (lbs./acre)	12 (lbs./acre)	13 (lbs./acre)	14 (lbs./acre)
Grasses and Sedges				**75-85**	**260-300**	**300-340**	**340-380**	**375-425**
Western or Thickspike wheatgrass	PASM ELLAL	14	10-25		35-90	40-100	45-110	50-125
Bluebunch wheatgrass	PSSP6	2	15-30		50-105	60-120	70-135	75-150
Alkali sacaton	SPAI	1	10-20		35-70	40-80	45-90	50-100
Sandberg bluegrass	POSE	12	5-10		18-35	20-40	23-45	25-50
Inland saltgrass	DISP	15	5-10		0-50	0-60	0-70	0-75
Indian ricegrass	ORHY	2	0-15		18-35	20-40	23-45	25-50
Plains reedgrass	CAMO	16	0-10}		18-35	20-40	23-45	25-50
Other native grasses	2GP		0-5}					
Sedge spp.	CAREX	12	0-5	T	0-18	0-20	0-23	0-25
Other native grasses	2GP		0-5}					
Forbs				**1-5**	**3-18**	**4-20**	**5-23**	**5-25**
Slimflower scurfpea	PSTE3	23	0-5	5	0-18	0-20	0-23	0-25
Pussytoes spp.	ANTEN	20	0-5					
Rush skeletonweed	LYJU	20	0-5					
Prairie thermopsis	THRH	20	0-5					
Hairy goldenaster	CHVI6	23	0-5					
American vetch	VIAM	18	0-5					
Buckwheat spp.	ERIOG	23	0-5					
Biscuitroot spp.	LOMAT	24	0-5					
Other native forbs	2FP		0-5					
Shrubs and Half-shrubs				**10-20**	**35-70**	**40-80**	**45-90**	**50-100**
Greasewood	SAVE4	37	5-10	10	18-35	20-40	23-45	25-50
Nuttall's saltbush	ATNU2	34	5-10	10	18-35	20-40	23-45	25-50
Slenderbush eriogonum	ERMI4	38	0-5	5	0-18	0-20	0-23	0-25
Prairie rose	ROAR	38	0-5					
Wyoming big sagebrush	ARTRW	37	0-5					
Longleaf sagebrush	ARLO7	38	0-5					
Winterfat	KRLA2	35	0-5					
Shadscale	ATCO	34	0-5					
Other native shrubs	2SB		0-5					
Broom snakeweed	GUSA2	37	0-T	T	0-T	0-T	0-T	0-T
Plains pricklypear	OPPO	38	0-T					
Total Annual Production (lbs/ac):			**100%**		**350**	**400**	**450**	**500**

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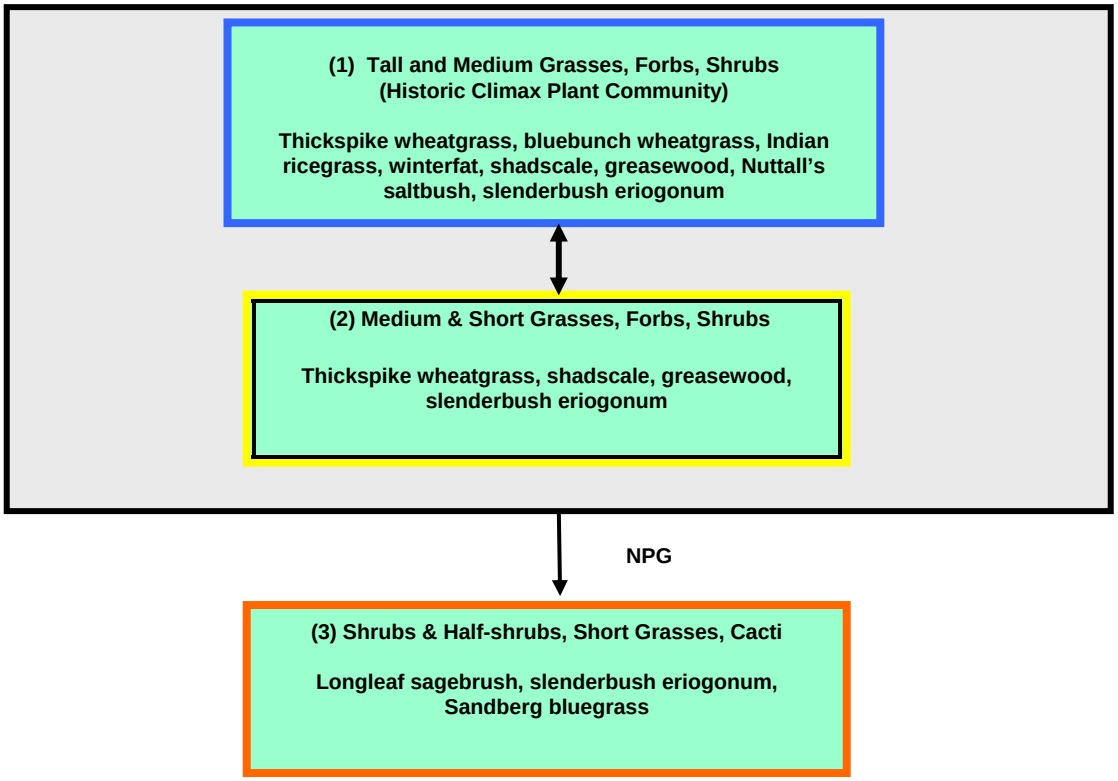
5c. Plant Communities and Transitional Pathways (diagram)



Smaller boxes within a larger box indicate that these communities will normally shift among themselves with slight variations in precipitation and other disturbances. Moving outside the larger box indicates the community has crossed a threshold (heavier line) and will require intensive treatment to return to Community 1 or 2. Dotted lines indicate a reduced probability for success. Yellow boxes indicate caution that the community may be in danger of crossing a threshold. Orange boxes represent communities that have crossed over thresholds from the HCPC and may be difficult to restore with grazing management alone. Red boxes represent communities that have severely shifted away from the HCPC and probably cannot be restored without mechanical inputs.

NOTE: Not all species present in the community are listed in this table. Species listed are representative of the plant functional groups that occur in the community.

PG = Prescribed Grazing: Use of a planned grazing strategy to balance animal forage demand with available forage resources. Timing, duration, and frequency of grazing are controlled and some type of grazing rotation is applied to allow for plant recovery following grazing.

NPG = Non-Prescribed Grazing: Grazing which has taken place that does not control the factors as listed above, or animal forage demand is higher than the available forage supply.

Fire: Prescribed fire or non-prescribed wildfire.

Matted: > 50% cover

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6. Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce high quality forage. However, forage production can be severely limited by the soil properties. Management objectives should include maintenance or improvement of the plant community. Shorter grazing periods and adequate re-growth after grazing are recommended for plant maintenance and recovery. Heavy stocking and season-long use of this site can be detrimental and will alter the plant community composition and production over time.

Whenever Plant Community 2 (medium and short grasses and sedges) occurs, grazing management strategies need to be implemented to avoid further deterioration. This community is still stable, productive, and healthy provided it receives proper management. This community will respond fairly quickly to improved grazing management, including increased growing season rest of key forage plants. Grazing management alone can usually move this community back towards the potential community.

Plant Communities 3 and 4 have substantially reduced forage production, and a high percentage of aggressive, non-palatable species. Once these plant communities become established, it will be much more difficult to restore the site to a community that resembles the potential with grazing management alone. Additional growing season rest is often necessary for re-establishment of the desired species and to restore the stability and health of the site. Practices such as range seeding or mechanical treatment are generally not recommended on this site.

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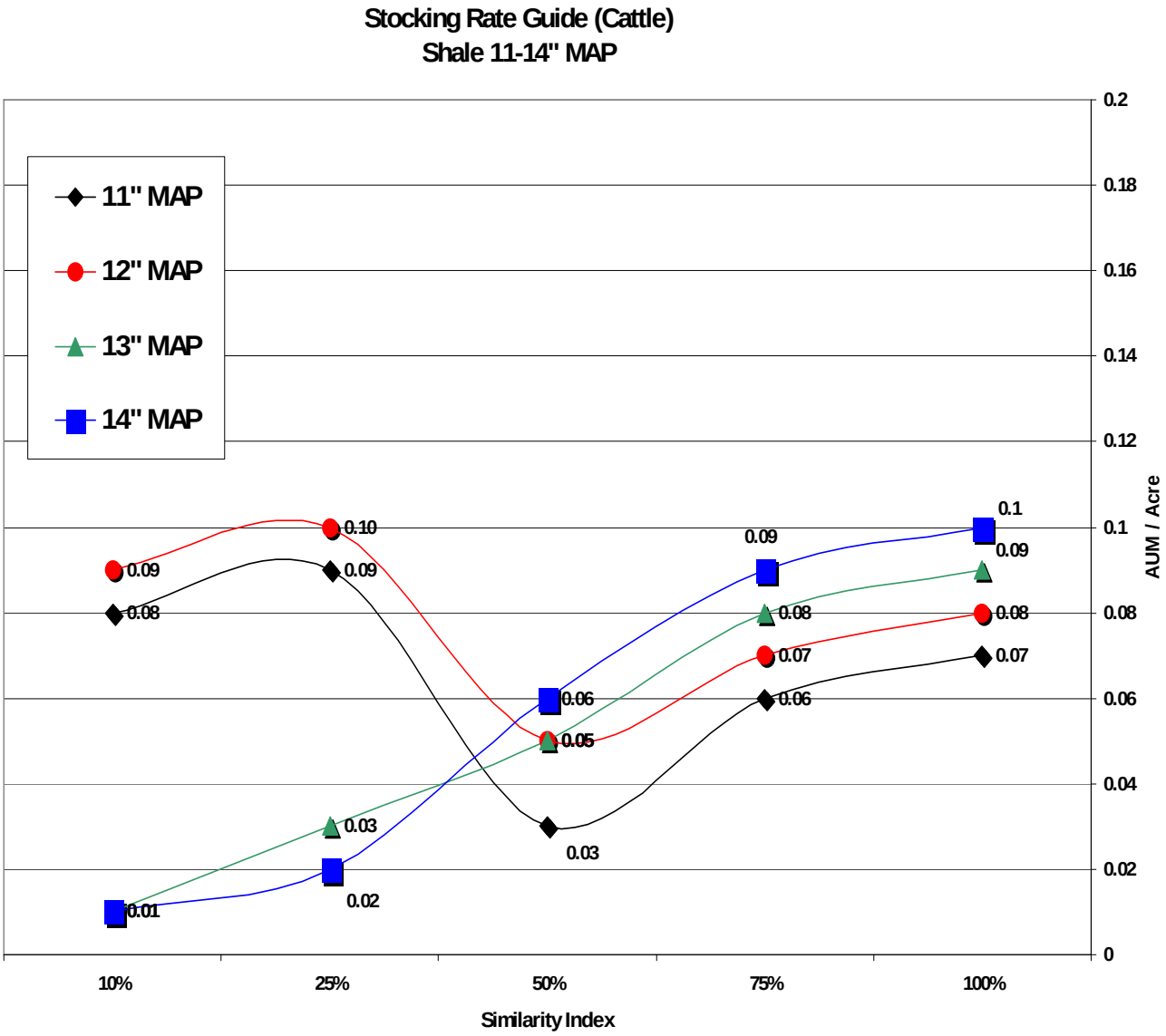
6a. Guide to Safe Stocking Rates: The following charts provide guidance for determining an initial safe stocking rate. Animal Unit Month (AUM) figures are based on averages of forage production from data collected for this site over several years. The characteristic plant communities and production values listed may not accurately reflect the productivity of a specific piece of land. These tables should not be used without on-site information collected to determine the average forage productivity of the site. Adjustments to stocking rates for each range unit must be made based on topography, slope, distance to livestock water, and other factors which effect livestock grazing behavior.



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6b. Stocking Rate Guide:

Major Plant Community Dominant Plant Species	MAP	Total Production (pounds/ac)	Cattle			Sheep		
			Forage Production	AUM/ac	Ac/AUM	Forage Production	AUM/ac	Ac/AUM
1. Tall and Medium Grasses, Forbs, Shrubs (HCPC) *Western/ thickspike wheatgrass, green needlegrass, Nuttall's saltbush, winterfat, Wyoming big sagebrush* **(S.I. > 75%)**	13-14"	450 – 500	325 – 375 +	.09-.10 +	9.8-11.3	350 - 400 +	.10-.11 +	9.2-10.5
	11-12"	350 – 400	250– 300 +	.07-.08 +	12.2-14.6	275 - 350 +	.08-.10 +	10.5-13.3
2. Medium & Short Grasses, Forbs, Shrubs *Western/ thickspike wheatgrass, blue grama, Sandberg bluegrass, Wyoming big sagebrush, green needlegrass, Nuttall's saltbush* **(S.I. 40-75%)**	13-14"	250-375	150-300	.04-.08	12.2-24.4	175 – 300	.05-.08	12.2-20.9
	11-12"	195-300	125-250	.03-.07	14.6-29.3	125-250	.03-.07	14.6-29.3
3. Shrubs & Half-shrubs, Short Grasses, Cacti *Wyoming big sagebrush/ greasewood, blue grama, Sandberg bluegrass, fringed sagewort, western/ thickspike wheatgrass, plains pricklypear* **(S.I. 20-40%)**	13-14"	70-200	25-75	.01-.02	48.8-146.4	25-100	.01-.03	36.6-146.4
	11-12"	450 – 500	325 – 375 +	.09-.10 +	9.8-11.3	350 – 400 +	.10-.11 +	9.2-10.5

Stocking rates are calculated from average forage production values using a 25% Harvest Efficiency factor for preferred and desirable plants, and 10% Harvest Efficiency for less desirable species. AUM calculations are based on 915 pounds per animal unit month (AUM) for a 1,000-pound cow with calf up to 4 months. No adjustments have been made for site grazability factors, such as steep slopes, site inaccessibility, or distance to drinking water.

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7. Wildlife Interpretations: The Shale ecological site, with its range of slope and aspect, provides habitat diversity where it occurs adjacent to large expanses of relatively level to rolling grassland. Historic wildlife populations were probably very similar to the modern day species composition. Winter range value for mule deer and pronghorn can be high when steep topography provides thermal cover and a variety of nutritious shrubs and half-shrubs are available on warm, open slopes. Overall production is fairly low on this severe site; however, the variety of plant growth forms provides habitat diversity for many wildlife species, particularly when this site occurs in a mosaic pattern with other, more productive ecological sites.

Plant Community 1: Tall Grasses/ Forbs/ Shrubs (HCPC): A variety of grasses, forbs and woody plants provides a relatively long flowering period for pollinating insects. Short-horned lizards and the prairie rattlesnake are representative reptiles. Ground-nesting bird habitat is limited. Common nighthawks, loggerhead shrikes and Brewer's sparrows are potential breeding birds. A variety of raptors hunt small mammals, insects and birds in this habitat.
The high percentage of nutritious shrubs and half-shrubs favors browsers and mixed feeders like mule deer and pronghorn, particularly on winter range. Seed production from shadscale, greasewood and other shrubs and half-shrubs supports seed-eating small mammals such as deer mice and kangaroo rats.

Plant Community 2: Medium and Short Grasses and Sedges/ Shrubs and Half-shrubs: Insect diversity is reduced as plant variety declines. Reptile populations are probably little affected at this stage. Brewer's sparrow may increase with increasing big sagebrush cover. Big game habitat value declines with the reduction of winterfat and other browse plants. Small mammal population diversity is reduced; the ubiquitous deer mouse is the dominant species present.

Plant Community 3: Shrubs/ Short Grasses/ Half-shrubs/ Cacti: General wildlife habitat values are quite low in this impoverished community. Insect population diversity further declines as the plant community is simplified. Reptile cover is very sparse. Breeding bird diversity is very low. Pronghorn and mule deer may find some browse species on winter range but nutritional levels are inadequate with the loss of valuable species such as winterfat and Nuttall's saltbush.

8. Hydrology Data: The soils associated with this ecological site are generally in Hydrologic Soil Group D. The infiltration rates for these soils will normally be slow. The runoff potential for this site is high to very high, depending on slope and ground cover/health. Runoff curve numbers generally range from 85 to 94.

9. Site Documentation:

Authors: Original: NRCS, 1983 Revised: MJR, REL, RSN, POH, 2003

Supporting Data for Site Development:

NRCS–Production & Composition Record for Native Grazing Lands (Range-417): 8

BLM–Soil & Vegetation Inventory Method (SVIM) Data: 2

NRCS–Range Condition Record (ECS-2): 25

NRCS–Range/Soil Correlation Observations & Soil 232 notes: 13

Ecological Site Reference: NRCS 417 No.: Golden Valley County 520

Field Offices where this site occurs within the state:

Big Sandy	Columbus	Harlowton	Roundup
Big Timber	Crow Agency	Joliet	Stanford
Billings	Fort Belknap	Lewistown	White Sulphur Springs
Chinook	Hardin	Malta	Winnett

Site Approval: This site has been reviewed and approved for use:

Loretta J. Metz 10/22/2004
State Rangeland Management Specialist **Date**